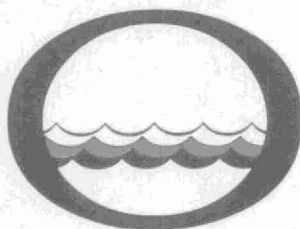


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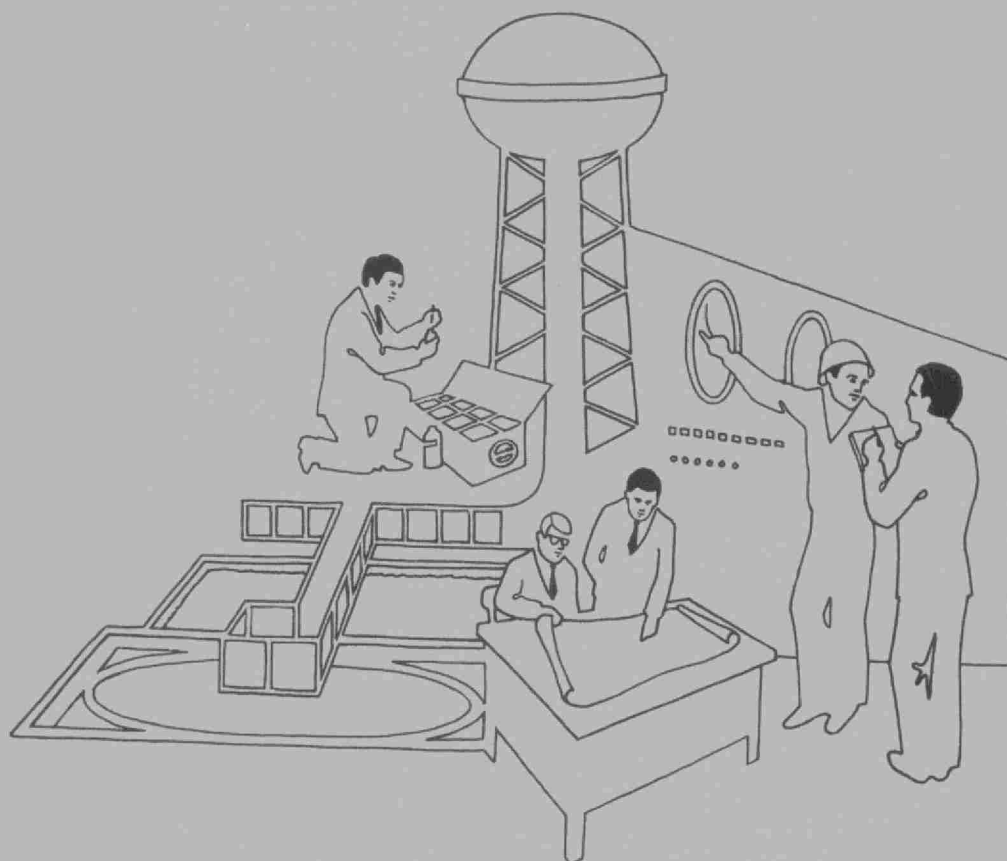


*Water management in Ontario*

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IMPROVEMENT DISTRICT OF RED ROCK  
WATER POLLUTION SURVEY OF TROUT CREEK

May 19, 20, 1970

DISTRICT ENGINEERS BRANCH - FIELD INVESTIGATIONS

MUNICIPALITY - Improvement District of Red Rock  
District of Thunder Bay

DATE - May 19, 20, 1970

MATTER INVESTIGATED - WATER POLLUTION SURVEY OF TROUT CREEK

REPORT BY - B. Howieson, Civil Technologist AT REQUEST OF -

DISTRIBUTION OF REPORT -

Dr. R.B. Walker, M.O.H., Thunder Bay  
H. Browne - Sewage Works Supervisor  
G. Kay - Supervisor, District Engineers Branch  
✓ W.A. Staggs - Supervisor, Water Quality Surveys Branch  
Central Records  
District File  
Regional File  
B. Howarth, Secretary-Treasurer

NO.	DATE PREPARED	DATE TYPED	TYPED BY	DATE APPROVED	DATE MAILED
224	July 6	July 24	/js	July 31/70	

## REPORT

# Ontario Water Resources Commission

Municipality Improvement District of Red Rock Date of Inspection May 19-20, 1970  
Re: WATER POLLUTION SURVEY OF TROUT CREEK  
Field Inspection by B. Howieson, Civil Technologist Report by B. Howieson

### INTRODUCTION

On May 19 and 20, 1970, inclusive, a water pollution survey of Trout Creek was conducted by Mr. B. Howieson, OWRC Technologist, in the Improvement District of Red Rock. Mr. F. Twa, Works Superintendent of the Town, provided information and assistance during the survey.

In conjunction with the above study, representatives of the Thunder Bay Health Unit carried out a municipal sanitary survey, which involved interviewing residents and conducting dye testing in the designated area along highway #628 extending from the town limits to the Trans-Canada Highway. The purpose of the dye testing at some locations was to determine the drainage pattern of various effluent discharges if the particular facility was suspect of inadequate operation. A brief report has been prepared by the Health Unit outlining their observations and conclusions of the study and summarizes the existing condition of this area respecting the adequacy in operation of these individual waste disposal facilities.

The purpose of this report is to outline the effects and resulting impairment that the existing waste disposal facilities are exerting on this watercourse and with supplementation of the Health Unit report, present an overall view of the potential pollution hazard in this area to the bacteriological quality of the municipality's present water supply. An accompanying plan of the area outlining the monitoring stations and pertinent information has been attached for reference, (Appendix 1).

In addition, a schematic drawing of Area "A" has been prepared and attached, (Appendix 2).

### GENERAL

In 1969, the assessed population of the Improvement District of Red Rock was 1,898\*. It is estimated that approximately 20 percent of this population reside outside the town proper with virtually all of these people located in houses scattered along Highway #628. For purposes of clarity, the study area has been subdivided into Areas "A" and "B", respectively. Area "B" refers to the houses not located on the municipal water supply system. Area "A" refers to the houses on the municipal water supply system.

At present, no municipal sewage services are available to any homes or commercial buildings in areas "A" or "B". Consequently, private septic tanks and privies are used exclusively for treatment and disposal of domestic sewage.

Generally, the stratum of the area is comprised of muskeg with varying deposits of sand and clay and would appear unsuitable for adequate operation of field tile type disposal units.

Trout Creek, as the appended plan illustrates, originates north of the Trans-Canada Highway in the form of three separate branches, ultimately converging together, prior to its discharge into Hopedale Bay.

Currently, the town's water supply intake is located only a few hundred feet opposite the mouth of the creek. The sampling locations were selected at the most suitable control points to monitor any adverse changes in the water quality of this watercourse and the resulting impairment to the town's source of water supply.

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### OBSERVATIONS

At the time of the study, considerable flow was observed in Trout Creek and numerous lateral ditches were observed draining into the watercourse. This is common at this time of the year.

In Area "B", a number of the waste disposal facilities were not operating satisfactorily in that evidence of direct sewage discharge from these homes into the creek was prevalent during this survey.

In Area "A", several homes adjacent to and including the Vicmore Hotel, on the north side of Highway #628, were noted to be directly discharging to an open conduit at the rear of the property which ultimately drains to Trout Creek. In addition, the CPR station located opposite the hotel on the south side of the highway was also found to be directly discharging to the same conduit. Several homes, south of the CPR station were found to have inadequate waste disposal facilities exemplified by ponding of the tile system in some of the backyards and by verbal reports from residents in the area. Furthermore, discharges of an unknown character from homes on the north side of the highway to storm drainage ditches along the highway were noted. Several of these conduits drained to the previously mentioned lateral ditches and subsequently to the creek. Finally, the CPR station's waste disposal facility was observed to be directly discharging to the creek. Observation and verification of these direct discharges were effected by means of sodium fluorescein dye being introduced at each of these various locations.

During the survey, visual examination along the banks of the creek revealed no adverse biological conditions or gross water impairment in existence with the exception of a small ponding area adjacent to the creek which showed the presence of algal blooms and sludge worms. This

area was to the rear of the conglomerate of homes south of the CPR station and possibly may be the result of direct laundry and/or domestic waste discharges from this settlement area. No bottom sludge samples of the stream were taken during the survey, although this may be of significance in future sampling in order to reveal more fully the existing impairment to this watercourse as a result of the waste discharges over the last few years.

#### WATER QUALITY ANALYSES

On May 19, 1970, a series of chemical and bacteriological samples were collected from this watercourse for the purpose of determining the changes in the stream's water quality following successive additions of various pollutants from numerous lateral ditches eventually connecting with the creek. It is felt that the source of these pollutants is of a domestic nature and stems from the homes and commercial establishments bordering and/or in proximity to the creek. In this regard, 12 monitoring stations were instituted and are designated T-1, T-2 . . . . . T-12 inclusive. Reference to the attached plan will be helpful.

The bacteriological and chemical results of the analyses carried out on the first set of stream water samples collected, are appended. The parameters utilized in the study to measure the level of pollutants in this watercourse were BOD<sub>5</sub>, Suspended Solids, A.B.S., Nitrogen and Phosphorus concentrations as well as Total Coliform Organisms/100ml. and use of each parameter has been appended, (Appendix 3).

A graph of the BOD<sub>5</sub> (ppm) concentrations versus each monitoring station has also been attached, (Appendix 4). It would appear that significant dilution as a result of the spring run-off period had occurred at the time of sampling. Nevertheless, it should be noted that generally the BOD and suspended solids concentration increased progressively at each successive downstream station, reaching a noted maximum level at the location of station

T-8 which is the final control point before entering the mouth of Trout Creek. Accordingly, the concentrations of these two parameters in the subsequent downstream stations decrease rapidly because of the natural assimilation ability of Nipigon Bay. The curve on the attached graph illustrates this. Reflecting on the other parameters, e.g. A.B.S., etc., comments are withheld until further sampling runs have been completed and more information is available.

The bacteriological results of the samples collected at this time upon examination, revealed fluctuating but overall increases in the concentration of coliform organisms following each successive station up to Station T-8.

Following this station, significant decreases were observed in the coliform concentrations and could be attributed again to the high dilution factor of Nipigon Bay. However, it has been noted that past bacteriological samples of the town's raw water collected from the treatment plant have exemplified the high concentrated coliform nature of the supply. In addition, considerable bacteriological sampling of Nipigon Bay has been completed and it would appear that the source of contamination to the town's water supply is Trout Creek. It should further be noted that not only is this water-course unpotable, it is considered unacceptable for any recreational activity such as swimming etc., as it exceeds the maximum limit of 2400 coliforms per 100 millilitres set for safe surface water activity in Ontario.

Of particular interest is monitoring station T-8 whose location is at the mouth of the lateral ditch which receives domestic wastes from the hotel and several adjacent homes on the north side of Highway #628. Certainly the chemical and bacteriological results from samples collected at this station exemplifies the high polluted nature of the flow discharging into the creek, resulting from unsatisfactory operation of these waste disposal facilities.



It would appear that this is the major source of pollution to Trout Creek and elimination of these discharges in all likelihood would significantly improve the water quality of this watercourse.

#### POPULATION GROWTH AND EXPANSION

Over recent years, particularly since 1960, the population of this municipality has realized a steady overall growth up to its present population of 1,898. Although minor periodic fluctuations in the growth rate have occurred, it would appear that this area will continue to grow as it has over the last decade. Therefore, in the interests of sound municipal planning and elimination of any future potential pollution of Trout Creek resulting from similar sources as in existence, zoning and subdivision controls should be instituted in the municipality which will ensure aversion of future problems of this nature and in addition regulations governing the size and spacing of lots, type of waste disposal facility, etc., should be implemented for reasons previously mentioned.

#### CONCLUSIONS

From the pollution survey conducted on May 19 and 20, 1970, it can be established that impairment of Trout Creek was occurring as a result of the discharge to the watercourse of improperly treated domestic wastes. The wastes originate from the development located adjacent to Highway #638, particularly that area designated as Area "A".

It is further concluded that the impairment of the watercourse would be far more evident if another pollution survey, similar to the May survey, were carried out during low flow periods in August. At that time of the year, there can be no doubt that the concentrations of BOD<sub>5</sub> and Suspended Solids would be significantly higher. With this in mind, therefore, it is concluded that a concentrated effort is required on the part of the municipality and the residents in Area "A" and "B" to eliminate the discharge of wastes which could result in serious water quality impairment and/or a potential danger to health.



With respect to the monitoring of conditions in Trout Creek during the summer period, further sampling of the watercourse should be implemented in the near future. This would provide invaluable water quality data respecting not only the watercourse but as well the quality of the drinking water supply in terms of bacterial contamination.

In summary, it would appear that the homes in Area "B" being so far removed from the town's present sewerage system, would have to apply corrective measures to this problem on an individual basis. On the other hand, it would seem economically feasible and in the end more practical to service the homes in Area "A" which would involve an extension of the town's present collection system, along Highway #628 up to the end of the existing watermain.

#### RECOMMENDATIONS

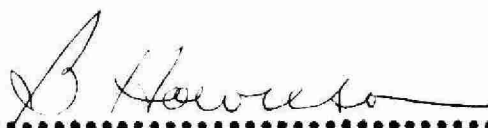
The following recommendations are presented:

(1) Several of the disposal facilities serving the homes in Area "B" should be corrected on an individual basis and in this regard representatives of the Health Unit should be contacted for their assistance to ensure that adequate operation of these various units is effected and that discharges to Trout Creek from these sources are terminated.

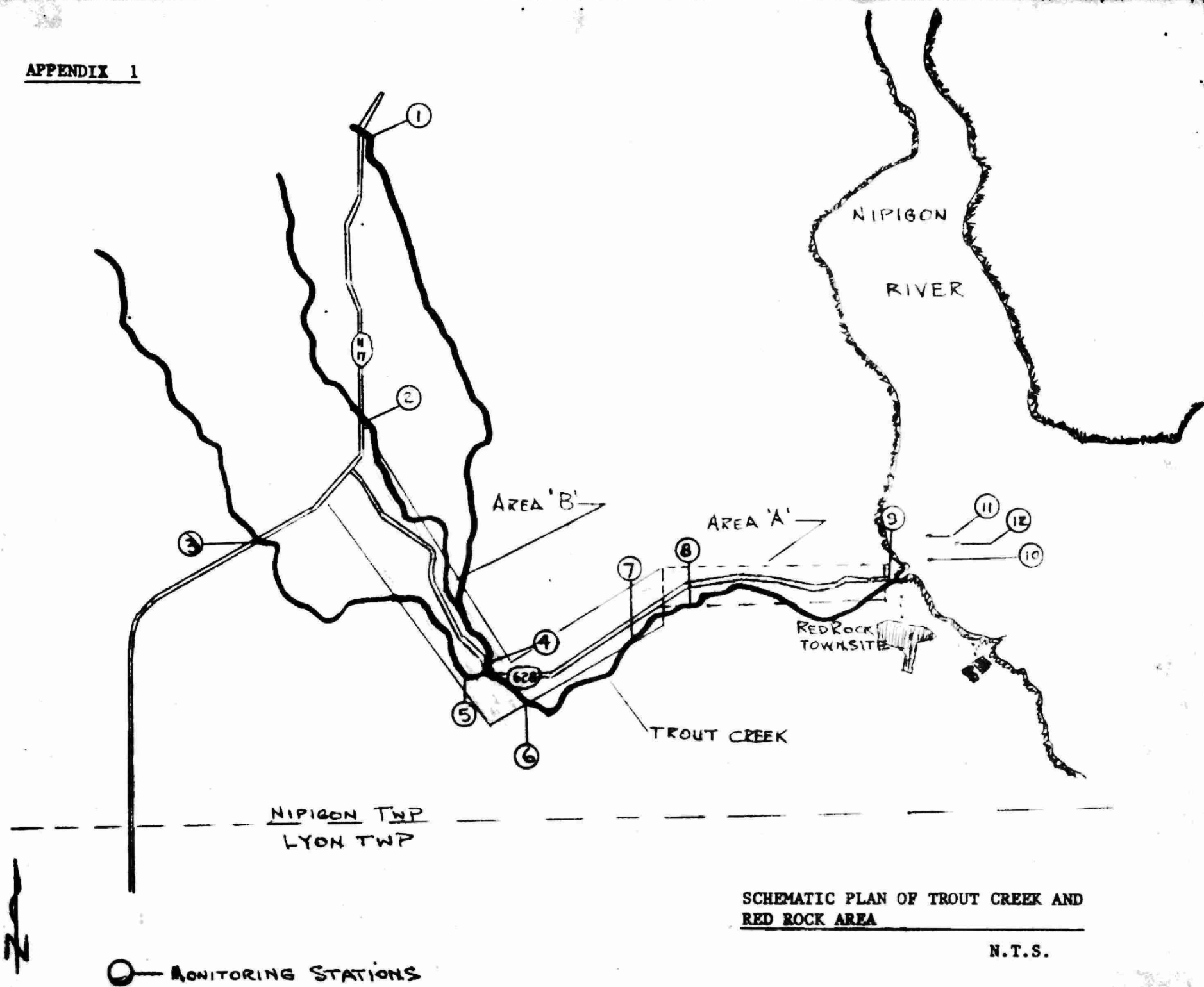
(2) Implementation of a sewer extension from the town's present sewerage system along Highway #628 up to the end of the existing municipal water main should be effected as soon as possible in order to eliminate the existing impairment of Trout Creek.

(3) The municipality should seriously consider adopting zoning and subdivision controls which would regulate the further development of the area bounded by Trent Creek, Highway #17 and the Nipigon River in order that future problems of the nature reported in this report can be avoided.

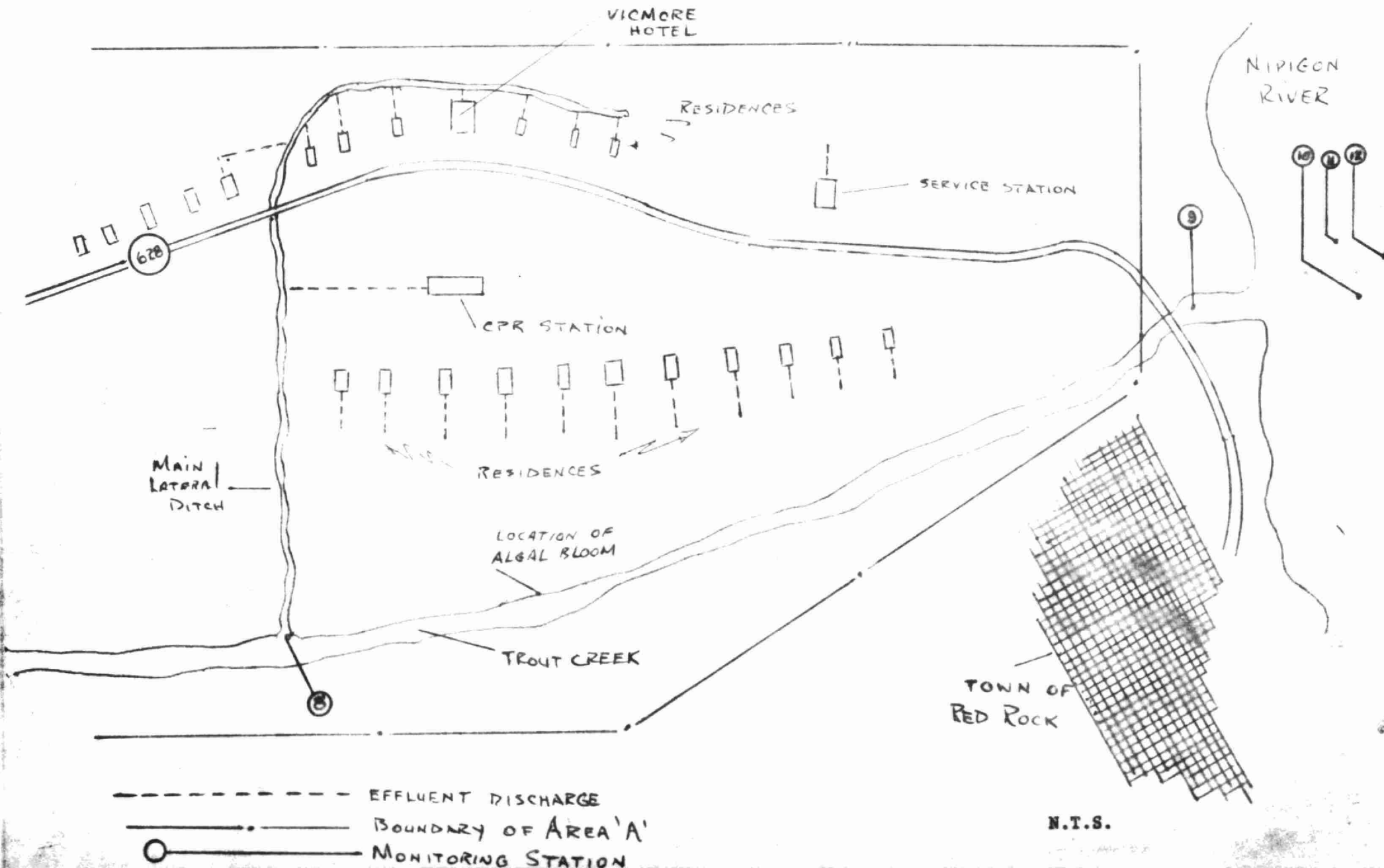
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B. Howison,  
Civil Technologist.

APPENDIX 1



SCHEMATIC DRAWING OF AREA "A"



## APPENDIX 3

### SUMMARY OF PARAMETERS

#### Bacteriological Examination

The presence of coliforms indicates pollution from human or animal excrement, or from some non-faecal forms. The objectives for surface water quality in Ontario is a maximum of 2400 organisms per 100 millilitres.

The OMRC Laboratories employ the Membrane Filter (MF) technique of examination to obtain a direct enumeration of coliform organisms. The Department of Health Laboratories use the Most Probable Number, (MPN) enumeration and coliform counts are reported as Total Coliform Organisms, (TC) and Faecal Coliform Organisms, (FC).

#### Sanitary Chemical Analyses

##### Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand is reported in parts per million (PPM) and is an indication of the amount of oxygen required for the stabilization of decomposable organic or chemical matter in water. The completion of the laboratory test required five days, under controlled incubation temperature of 20° Centigrade.

The OMRC objective for surface water quality is an upper limit of four (4) ppm.

##### Solids

The value for solids, expressed in parts per million, is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally the most significant of the solids analyses with regard to surface water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, decomposition in streams and injury to the habitat of fish.

### Nitrogen

Ammonia Nitrogen or sometimes called free ammonia, is the insoluble product in the decomposition of nitrogenous organic matter. It is also formed when nitrates and nitrites are reduced to ammonia either biologically or chemically. Some small amounts of ammonia, too, may be swept out of the atmosphere by rain water.

The following values may be of general significance in appraising free ammonia content: Low 0.015 to 0.03 ppm; moderate 0.03 to 1.10 ppm; high 0.10 or greater.

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. The Total Kjeldahl less the Ammonia Nitrogen measures the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

### Nitrite Nitrogen

Nitrite is usually an intermediate oxidation of ammonia. The significance of nitrites, therefore, varies with their amount, sources, and relation to other constituents of the sample, notably, the relative magnitude of ammonia and nitrite present. Since nitrite is rapidly and easily converted to nitrate, its presence in concentrations greater than a few thousandths of a part per million is generally indicative of active biological processes in the water.

### Nitrate Nitrogen

Nitrate is the end product of aerobic decomposition of nitrogenous matter, and its presence carries this significance. Nitrate concentration is of particular interest in relation to the other forms of nitrogen that may be present in the sample. Nitrates occur in the crust of the earth in many places and are a source of its fertility.

The following ranges in concentration may be used as a guide:

low, less than 0.1 ppm: moderate, 0.1 to 1.0 ppm: high, greater than 1.0 ppm.

Anionic Detergents as ABS

The presence of anionic detergents as ABS is an indication that domestic waste is present.

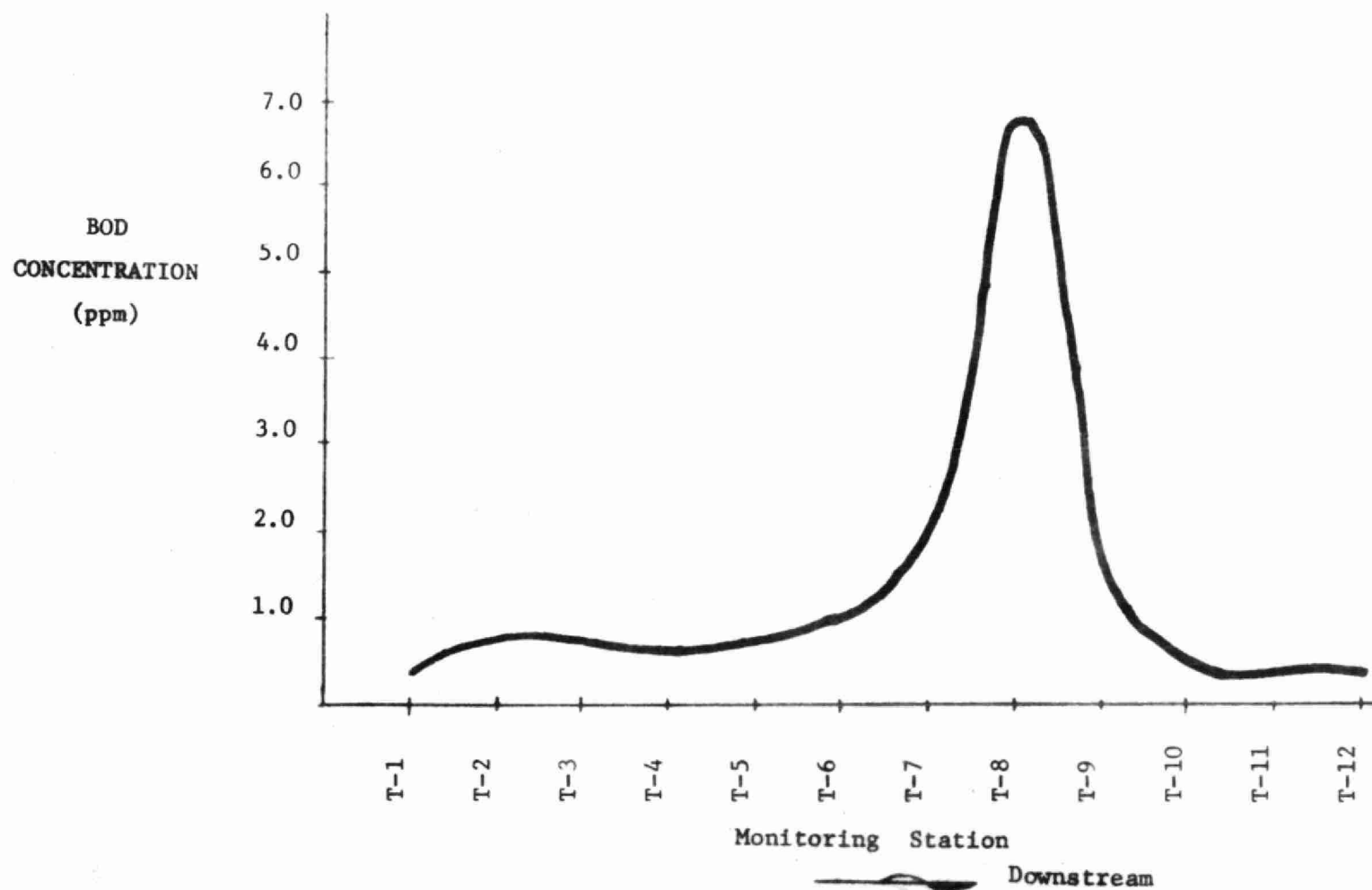
Phosphorus

Phosphorus also is a by-product of the decomposition of organic wastes and, in addition, may occur in considerable quantities in industrial wastes and land drainage. It serves as an important nutrient and if present in excessive amounts, may cause the development of profuse growth of aquatic plants which may interfere with the normal uses of water such as water supply and stock watering. The normal amount of phosphorus as  $PO_4$  in water is approximately 0.01 ppm.



APPENDIX 4

GRAPH OF BOD CONCENTRATION VERSUS MONITORING STATION



## CHEMICAL LABORATORIES

## RIVER ANALYSES

 All analyses except pH reported in  
p.p.m. unless otherwise indicated

 1 p.p.m. = 1 mgm. / litre  
= 1 lb. / 100,000 Imp. Gals.

 Municipality: **I.D. Red Rock**

 Report to: **District Engineer, OWRC  
Thunder Bay Regional Office**

c.c.

 Source: **as noted below**

 Date Sampled: **May 19/70**

 by: **B. Howieson**

## BACTERIOLOGICAL RESULTS

Lab. No.	BOD	Susp.	ABS	NITROGEN AS N			PHOSPHORUS AS P		Coliforms/100 ml.	ml.
		Solids		Free Ammonia	Total Kjeldahl	Nitrite	Nitrate	Total		
R-179	0.4	2	**	.05	.39	.006	.06	.006	.003	200
R-180	0.6	11	0.0	.01	.36	.009	.05	.30	**	144
R-181	0.6	10	0.1	.01	.29	.007	.07	**	**	172
R-182	0.5	36	**	.03	.37	.007	.06	.040	.014	2100
R-183	0.7	48	**	.04	.36	.009	.09	.051	**	4300
R-184	0.8	221	0.0	.02	.75	.007	.08	.13	.014	4200
R-185	2.1	63	0.0	.12	.75	.007	.09	.071	.009	2100
R-186	6.9	22	0.1	.87	**	.020	.23	**	.27	140,000
R-187	1.3	20	**	.17	.75	.007	.10	.048	.017	4400
R-188	0.4	128	0.0	.01	.48	.003	.06	.080	.028	52
R-189	0.4	94	**	.02	.37	.002	.06	.060	.007	32
R-190	0.3	28	**	**	**	**	**	**	**	L 4
** Sample Exhausted										
R-179	T-1	Junction of Hwy. 17 & Tributary of North Trout Creek								
R-180	T-2	Junction of Hwy. 17 & North Trout Creek								
R-181	T-3	Junction of Hwy. 17 & South Trout Creek								
R-182	T-4	North Trout Creek Upstream from confluence at Junction of Hwy. #628 and Creek								
R-183	T-5	South Trout Creek Upstream from confluence								
R-184	T-6	Junction of Trout Creek and CPR Railway								
R-185	T-7	Trout Creek Above Settlement								
R-186	T-8	Small Stream discharging into Trout Creek (junction)								
R-187	T-9	Junction of Trout Creek & Hwy. #628								
R-188	T-10	400 ft. out into Nipigon Bay opposite mouth of Trout Creek								
R-189	T-11	Nipigon Bay upstream from mouth of Trout Creek								
R-190	T-12	Raw sample taken from plant								